

Fire Investigator Independent Study Continuing Education

NFPA 921 UNIT #2

NFPA 921 Guide for Fire and Explosion Investigations 2004 Edition

Objective: Given an examination the participant shall demonstrate a knowledge and understanding of basic fire science.

Reading/study assignment: NFPA 921 Guide for Fire and Explosion Investigations, 2004 Edition, pp. 921-15 through 921-30 (Chapter 5)

Study/reference questions:

How does surface-to-mass ratio to heat release rate?

What are products of combustion, how do they react to surfaces, what about color, etc?

Is this information complete, covers the basics, introductory, etc.?

What type of heat transfer is flame contact?

Where should the user of this guide consult for additional information?

Study Tables 5.5.2(a) and 5.5.2(b).

Is oxygen an oxidizing agent, the only oxidizing agent?

What is the difference between organic and inorganic fuel?

Study various approximate radiant heat fluxes on Table 3.5.3.2.

Do materials burn directly in a solid form?

How are fires prevented or suppressed?

What is fuel?

What is a ceiling jet?

How do unconfined fires react?

What are examples of inorganic fuels?

Matter exists in what phases?

The phase of the material depends on what?

Study Figures 5.5.4.2, 5.5.4.2.1, 5.5.4.2.2, 5.5.4.2.6, and 5.5.4.2.7.

Where does combustion of a solid take place?

What are some common materials subject to self heating?

Where can heat for combustion come from?

What about heat and vapors, pyrolysis products, and proper mixture?

What about environment temperature and oxygen requirement relationships?

What about time and energy required for ignition and the rate of heat transfer, etc.?

Does the form of a solid or liquid affect burning rate?

What is fuel also called? (See diagram of tetrahedron)

How does fire spread in buildings?

What about heat, intensity, how defined, and what does it do in a fire?

What are other (other than oxygen) oxidizing agent examples?

What is an oxidizer fire?

The investigator should have a basic understanding of what?

What about smoldering and oxygen concentrations?

Normal air contains what percent oxygen?

What is range of mixtures?

Can combustion occur in very low percentage oxygen atmospheres & what affects this?

Flaming combustion at room temperatures occurs as low as what oxygen concentrations?

What about oxygen requirements in post-flashover conditions?

What is mechanism of self-heating to ignition, how does it occur, what affects it?

What symbolizes the four components of the combustion reaction?

What are the four components of the combustion reaction?

Can fuels in hot, oxygen depleted locations be consumed?

Most fuels contain what chemicals in varying ratios?

What is fire spread and how does it occur?

How does flame spread over solids and liquids occur? Which is faster? Why?

What about flammable/explosive limits, including lower, upper, and how expressed?

Flammable limits are usually corrected to what?

How does temperature and pressure affect flammable limits?

What fuels are listed with wide flammable/explosive ranges?

What is optimum ratio, stoichiometric ratio and what do these have to do with fire?

What about ventilation-controlled fires, venting gases, hot gases, etc.?

What are uninhibited chemical chain reaction, slow oxidation, examples of slow oxidation?

What about fuel vapor or gas and oxidizer mixtures, distance from fuel source, etc.?

What about self-heating and self-ignition of motor oil?

Study ignition of solid fuels including surface to mass ratio relevance.

What about ignition of liquids?

Study ignition.

What are paths of smoke spread in buildings?

Combustion can occur by what two mechanisms, how, what can happen, etc.?

What is heat transfer, what are the mechanisms, how expressed, how related to temperature, which mechanisms play a role in a fire, etc.?

What about fuel-controlled fires?

Study conduction!

Study Table 5.2.2.2 and what this tells you. (No exam questions from this table)

Study Figure 5.2.4.1 and what this tells you. (No exam questions from this figure)

What about cigarettes, upholstered furniture, smoldering, toxic compounds, etc.?

What are pyrophoric materials?

Study Table 5.3.1.1.

Can gases form flammable mixtures in atmospheres other than air or oxygen, what example?

What about smoldering in relation to forced pyrolysis?

Study Table 5.3.2.3 (Do not need to memorize data but study relationship of time & temp).

What about ignition of gases?

What is said about self-heating to ignition in reference to wood and charcoal briquettes?

Study convection!

Is transition from smoldering to flaming combustion always fast or slow? If slow how is development of fire affected? Why?

What about ignition properties of materials?

Study figures 5.3.2.6 and 5.3.2.6.

Study Table 5.4.2.1.

What about layers in relation to the ceiling and the plume?

What state must most materials be in to be ignited?

Study radiation!

What factors affect self-heating and self-ignition?

What about rate of heat generation, effects of ventilation, and insulating effect in relation to self-heating and self-ignition?

Study Table 5.3.5.

Study Table 5.3.6.3.2.

Study fuel load.

Study products of combustion!

What Btu relationship between wood and plastic is given?

What about witness statements in relation to fuel load and rate of fire growth?

What about fuels and HRR, surface area, low-density vs. high-density, peak HRR, etc?

What about fire development?

What about the smoldering reaction?

What about gaseous fuels and vaporization?

What about plumes?

What is self-heating/self-ignition?

What about fires confined by a ceiling?

What about ventilation openings?

What about heat transfer and fire growth in relation to the ceiling and the plume?

What factors affect what in relation to the ceiling and the plume?

Study figures 5.5.2 (a) and (b) and figures 5.5.4.1 (a) and (b).

What happens in oxygen enriched atmospheres?

Study 5.5.4.2 Compartment Fires and Flashover completely!

Will enclosures affect fire growth?

What about room volume and ceiling height?

How does temperature affect the oxygen requirement for combustion?

What about location of the fire in the compartment? Note: Study this!

What about flame height?